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APPENDIX J

AEROMEDICAL ANALYSIS SAMPLE

The structure and content of the Aeromedical Analysis (AA) is presented in Aeromedical Analysis section of this guide. A sample AA is included here to represent how a good AA should be written. For those Flight Surgeons that are unfamiliar with or need review of the Human Factors Analysis and Classification system (HFACS), an introduction to HFACS precedes the sample AA. Finally, the Naval Safety Center cannot stress enough the inclusion of all the enclosures and the proper completion of all of the forms. This information is placed in a database from which important conclusions are derived about saving lives and aircraft. Flight Surgeons are encouraged to elicit the help of AMSO's, PR's, NATOPS personnel, squadron safety personnel, and the Naval Safety Center, so that the forms may be finished in a timely and complete manner. **NOTE:** The **AA and 72 hour history contain privileged information** and must be labeled accordingly and submitted with all AA enclosures on Side B of SIR.

SAMPLE AEROMEDICAL ANALYSIS

FLT SRGN: William Smith **Rank/Grade**: LT, MC, USN (FS)
Mailing Address: UNIT 009 BOX 636 FPO AE 12345-6789
Phone Numbers: DSN 999-1234, Commercial (123) 321-1234
E-Mail: wsmith@anycommand.navy.
Date Aeromedical Analysis submitted: 1/1/98
Hours spent in investigation: 90
AMSO or others who assisted: LCDR Fred Jones, MSC, USN

ENCLOSURES TO AEROMEDICAL ANALYSIS

01 72 Hour Histories for Mishap Aircrew (SIR Form 3750/15)
02 AFIP Toxicology Reports
03 Post Mishap Physical Examinations and pertinent medical record extracts
04 Copies of past two Physical exams with waivers for all personnel

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05 Electronic version (on disk) of AA to Safety Center (Code 14 only)
06 Sensitive reports and pertinent photographs (PASS DIRECTLY TO THE AEROMEDICAL DIVISION CODE 14 NAVAL SAFETY CENTER)
07 Privileged supporting documentation.

ABBREVIATIONS USED

AA = Aeromedical Analysis
AC = Aircraft
AFIP = Armed Forces Institute of Pathology
AMB = Aircraft Mishap Board
ASO = Aviation Safety Officer
CDI = Collateral Duty Inspector
CO = Commanding Officer
CTW = Commander Training Wing
FRS = Fleet Replacement Squadron
FS = Flight Surgeon
H2P = Helicopter Second Pilot
HAC = Helicopter Aircraft Commander
HCO = Helicopter Control Officer
HEED = Helicopter Emergency Egress Device
HOSS = Helicopter Onboard Surveillance System
HT = Helicopter Training
IFF = Interrogate Friend or Foe
LPU = Life Preserver Unit
LSO = Landing Signal Officer
MA = Mishap Aircraft
MAC = Mishap Aircrewman
MC = Mishap Crew
MH2P = Mishap Helicopter Second Pilot
MHAC = Mishap Helicopter Aircraft Commander
MPAX = Mishap Passenger
NATOPS = Naval Aviation Training and Operating Procedures Standardization
OIC = Officer in Command
PAC = Pilot at Controls
PAX = Passenger
PCL = Pitch Change Link
RHIB = Rigid Hull Inflatable Boat

SA = Situational Awareness
SENSO = Sensor Operator
SOP = Standard Operating Procedures
SPDB = Student Progress Disposition Board
VFR = Visual Flight Rules
VT = Fixed Wing Training
WNL = Within Normal Limits
XO = Executive Officer

1. REVIEW OF EVENTS

a. Mishap Overview

Approximately 5 weeks prior to the mishap flight, the MH2P was the PAC during a night visual identification of a merchant vessel. The AC during this mission was the same AC as the MA. When decelerating and descending downwind to obtain a better visual identification of a merchant ship, the AC experienced an unintentional right yaw. The AC rotated through the wind line and completed 180 degrees of rotation before the MH2P regained control. After review of the incident with the HAC of that flight (not the MHAC) it was felt that the MH2P had become focused on the ship's lights and lost SA. This incident was not brought to the attention of the OIC (the MHAC) until after the mishap.

Three weeks prior to the mishap flight, the MH2P was the PAC during a day VFR launch from a sister ship. The AC during this mission was the same AC as the MA. Following an abrupt pull on the collective during takeoff, the AC completed 290 degrees of unintentional right yaw before the turn was arrested and the AC departed the ship. The seriousness of the event generated personal message traffic between the incident ship's CO and the detachment ship's CO. After review of the incident by the HAC of that mission (same HAC as in the first incident described above) with the MH2P, it was felt that the AC had most likely a little right pedal remaining in following the prior landing. This slight right pedal input combined with an abrupt pull on the collective and some confusion on the wind direction resulted in the rightward yaw upon takeoff. Before the effects of

appropriate left pedal input took over, the AC tail swung through the windline (15 degrees to port) adding additional force to the rightward turn. Regardless of wind direction, rightward or leftward yaw or pedal turns is never tolerated on takeoff, especially from a ship at sea. The typical brief is that when the nose breaks on takeoff put the AC down if at all possible. The incident was not brought to the attention of the detachment OIC until after the personal message traffic between the two ship COs. The MH2P was later informally counseled by the OIC but the incident was not brought to the attention of the squadron CO. Moreover, the OIC was not aware of the first incident at the time of this counseling.

In addition to these two incidents, the MH2P had the controls taken from him on two other occasions during this detachment. The first was when he drifted over the LSO control station during takeoff and did not respond to verbal direction from the HAC. The second was when he again drifted right and the HAC lost sight of the flight deck environment. The MC had been on cruise for approximately 2½ months prior to the mishap. Except for the above mentioned incidents, the cruise had been uneventful.

The MC had flown an uneventful mission the night prior to the mishap. All three were in bed by 0100 on the day of the mishap. The MC had received adequate rest prior to the mishap. The mission was to be a routine patrol. The XO of the ship was to accompany them as a PAX on a familiarization flight. The briefs and manup were uneventful. The MPAX sat in the SENSO seat and the MAC sat in the rescue seat in the far aft of the MA. Flight quarters were called and the rotors engaged. The MC then spent approximately 30 minutes trouble shooting an IFF problem. Once the IFF problem was fixed, the MHAC decided the crew would perform a cross-cockpit takeoff with the PAC (MH2P) in the right seat and the MHAC in the left seat with the MA in the starboard trap. The decision to perform the cross-cockpit takeoff was not made until the takeoff checklist had been completed. There was no formal brief but the MH2P stated that he was comfortable performing a cross-cockpit takeoff. Chocks and chains were removed and a "Green Deck" was called.

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With the MH2P at the controls, the MA lifted off and immediately began a rightward turn. It was noted the AC did not reach standard hover altitude of 5 feet. The MHAC remembers that the MH2P pulled collective quite slowly and was not abrupt on the controls. He also remembers looking at the pedals as soon as he noted the rightward yaw and did not see any right pedal deflection. Shortly after the onset of the turn, the MH2P uttered an expletive and attempted to "hold it steady." Between 60 and 90 degrees of turn, the MHAC had come on the controls and began to input left pedal, increasing deflection until he had applied full left pedal. The MHAC called set it down, but the MH2P did not respond. The MHAC then lowered the collective at approximately 160 to 180 degrees of yaw. The MA lost altitude, continued its rightward yaw, skipped across the flight deck and landed in the starboard safety nets, facing forward and teetering at nose high attitude of approximately 45 degrees. While the MA was in the nets, the MAC noted loose gear falling aft and lodging near the main cabin door, his primary egress route. He unfastened his harness and kicked the loose gear out the main cabin door. At this point the MH2P remembers fully lowering the collective. The MHAC then pulled the PCLs aft taking momentum off the rotor head. The MA increased its pitch to close to 90 degrees before rolling right, impacting the water tail low and completely inverted. The MAC was able to get two good hand holds before the MA hit the water, but these were jarred loose upon impact. All members of the MC felt that they were instantly submerged and had no opportunity for "one last breath."

The MAC was the first to surface, less than 10 seconds after the MA hit the water. The shaded visor had fallen down in front of his eyes during water impact, so he removed his helmet prior to egress. He did not feel a need to use his HEED bottle. On the surface, he did not inflate his LPU. He began counting heads and noted only two others besides himself. He then climbed onto the now sinking MA, removed his LPU, and dove back into the water along side the cockpit. He was able to feel around inside the cockpit, but did not find the missing crewman. He surfaced and noted the previously missing crewman (the MH2P) floating next to him. He then inflated the MH2P's LPU.

Reporting Custodian	HELSQUAD009	Mishap Severity:	A
Date of Mishap:	01 Dec 98	Mishap Category:	FM
Aircraft Model:	H-3	BUNO:	645123

The MPAX was the second to surface just after the MAC. The MPAX had difficulty finding the cabin window emergency release handle and opted to egress through the main cabin door. His LPU caught briefly in the doorway but he was able to free it without difficulty. He was uninjured and inflated his LPU on the surface.

The MHAC was the third to surface. Review of the HOSS tape revealed that it took 19 seconds for the MHAC to surface. During the interview, he stated that he had swallowed a lot of water and was afraid to use his HEED bottle for fear of aspiration. He admitted that he had initially given up and was thinking of how lonely it felt to drown. He began to think of his family and when he thought of his kids he "suddenly came to." He found the cockpit window emergency release handle, pushed it forward, released his harness, and pulled himself free. Once on the surface, he inflated his LPU.

The MH2P was the last to surface. Review of the HOSS tape revealed that it took 56 seconds for him to surface. During the interview, he stated that he had difficulty finding the cockpit window emergency release handle and opted to use his HEED bottle. He too felt that he had swallowed a lot of water. He found his HEED bottle, but failed to purge it prior to taking his first breath and aspirated a small amount of water. He then abandoned the HEED bottle. At this point, he admitted to feeling a little panicked. He removed his helmet and released his harness without holding onto a reference point. He moved towards what he thought was the aft portion of the helo looking for the main cabin door. When he encountered rotor pedals, he returned to his original position and found the cockpit window emergency release handle. He pushed it forward and egressed without difficulty. On the surface he was noted by the others to be confused. He did not inflate his LPU until assisted by the MAC.

The HOSS tape begins with the MA sitting in the starboard safety nets, nose high, with main rotor blades intact and still turning. The tail rotor cannot be seen even with frame by frame analysis. As the MA's pitch increases, the main rotor blades impact the water and can be seen disintegrating. The SENSO seat did not stroke properly. The rescue seat in the SH-60B is not a

stroking seat. The rescue seat had a broken support wire not noted on preflight. It was not a cause of additional injury to the MAC. Examination of all passenger compartments did not reveal any structural failure or additional damage caused by impact with their respective occupants. The MAC's helmet was lost at sea and therefore, unavailable for examination of defects related to the visors.

A complete review of aircrew and witness statements, damage to the ships flight deck, damage to the MA (salvaged 2 days after the mishap), and review of the HOSS tape lead the AMB to believe that the MA completed 180 degrees of right turn before the tail wheel impacted the flight deck. This was followed by the stabilator impacting the LSO control station and then the main mounts impacting after 240 to 270 degrees of yaw. Since the collective was not fully lowered, the MA retained some of its rightward momentum and bounced across the flight deck before landing in the starboard safety nets. A thorough wreckage examination of all tail rotor drive components, tail pylon, yaw flight-control linkage, and servos as well as engineering investigation of key drive chain components revealed internal scuffing on the piston of the tail rotor servo. Review of maintenance records was unremarkable. The damage to the tail rotor and tail rotor drive components was consistent with a rotating tail rotor at the time of water impact. This led the AMB to conclude that the unintentional right yaw may have been due to a sticking in the tail rotor servo mechanism. Other pilots on the DET did not notice sticking in the rudder pedals on prior flights in the MA.

Reconstruction of the mishap scenario was conducted in a simulator to look at yaw rates with minimal left-pedal input while simultaneously inducing a momentary sticking of the tail rotor servo piston. It was noted that "less than standard" input of left pedal at the time of collective pull produced rightward yaw rates approaching those observed by the MC and witnesses, especially as the AC rotates through the windline. The MH2P's minimal left-rudder input combined with the sticking servo allowed right turn yaw rates to develop that were not arrested. Therefore, the AMB concluded that a lack of left pedal input by the MH2P at the time the collective was pulled

was causal to the mishap. Visual inspection of the SENSO seat revealed the retaining nut of the lower actuator rod was missing. This resulted in an asymmetrical downward motion of the SENSO seat at the time of the mishap. The seat was last installed during a phase inspection six weeks prior.

b. Aircrew Profile

(1) MHAC

The MHAC is a 34-year-old Caucasian male LCDR with 1,600 total flight hours, 1,400 of which are in the MA model. He has been at the squadron for 10 months and this was his first OIC tour. He had previously served as an instructor pilot in the MA type. He is generally considered a mature, competent, and safe aviator who enjoys flying. There are no known interpersonal problems between him and his fellow officers or enlisted. He has been happily married for 7 years and has two daughters aged 2 and 5. During the detachment he has communicated with his family by e-mail and letters at least weekly. He has never been involved in a mishap prior to this one. He denies any psychosocial or financial problems.

NATOPS review was remarkable for having received three downs in his primary VT syllabus and one down in his advanced HT syllabus. He received two SPDBs during this time, both recommending retention. His overall HT grades were average. His FRS performance was noted to be outstanding. He had flown with the MH2P a total of three times in the past six months.

Medical record review revealed the MHAC to have a current flight physical on which he was found to be PQ/AA DIACA DNA SGI with no waivers. No active or recent medical problems were noted.

Review of his 72-hour history (Form SIR 3750/15) was remarkable for an average of only 6.5 hours of sleep/24 hours. He had only 6 hours of uninterrupted sleep prior to the mishap. His last alcoholic beverage was approximately 66 hours prior to the mishap. He was on no current medications.

Physiology training was up to date (Form SIR 3750/4).

The MHAC sustained some superficial lacerations, abrasions, and musculoskeletal injuries during the mishap (Form SIR 3750/3). He was released from ship's medical within an hour of presenting. AFIP toxicology results were all negative or WNL as were locally run labs and a complete spine series (Form SIR 3750/14 Enclosures (2) and (3)).

(2) MH2P

The MH2P is a 28 year old Caucasian male LT with 600 total flight hours, 350 of which are in the MA model. He has been at the squadron for 10 months and this was his first detachment as an H2P. He is generally considered to be a relatively inexperienced, but competent aviator and is liked by his colleagues. He is not known to have difficulty in getting along with his superiors and peers. There are no known interpersonal problems between him and his fellow officers or enlisted. As stated previously, he has had two prior unintentional loss of tail rotor authority situations during this cruise while he was the PAC. He does admit to being the recipient of mild banter from his fellow pilots on cruise for being abrupt on the controls, but does not feel that this has affected him in any way. He is single with no children. During the detachment he has communicated with his family and friends by e-mail and letters at least weekly. He has also had some communications (both e-mail and letters) with a former girlfriend he had broken up with just prior to going on this cruise. He has never been involved in a mishap prior to this one. He denies any psychosocial or financial problems.

NATOPS review was remarkable for having received four downs during the VT syllabus of his primary flight training. He received three SPDBs during this time. The last SPDB recommended attrition with CO concurrence, but CTW recommended retention. He was seen by his FS at this time, diagnosed with performance anxiety, grounded, and referred for stress management training. Psychological screening exams were WNL and he successfully completed the training. He was returned to flight status 14 days after being grounded. No major difficulties were noted in his intermediate or advanced

training. His overall HT grades were average. His FRS time showed a range of performance with both "hot and cold" days. He was known as a "plodder," getting through the syllabus without any serious problems, yet "carrying a reputation as being a bit lazy." No specific problem areas or negative trends were noted.

Medical record review revealed the MH2P to have a current flight physical on which he was found to be PQ/AA DIACA DNA SGI with no waivers. No active or recent medical problems were noted.

Review of his 72-hour history (Form SIR 3750/15) was unremarkable. His last flight was the night prior to the mishap with a land time of 0015 on the day of the mishap. He had 8.2 hours of uninterrupted sleep prior to the mishap. His last alcoholic beverage was approximately 64 hours prior to the mishap. He was on no current medications.

Physiology training was up to date (Form SIR 3750/4).

The MH2P sustained some superficial lacerations, abrasions, and musculoskeletal injuries during the mishap (Form SIR 3750/3). He also aspirated a small amount of sea water when he failed to purge his HEED bottle prior to inhaling. Initial room air pulse oximetry was 92%. He was placed on high flow oxygen and his lung fields cleared within 30 minutes. He was released from the ships medical department after 6 hours of observation. He was placed on prophylactic antibiotics due to the high prevalence of contaminated sea water. AFIP toxicology results were all negative or WNL as were locally run labs and a complete spine series (SIR Form 3750/14 enclosures (2) and (3)).

(3) MAC

The MAC is a 33-year-old Caucasian male AWH1 with 3,200 total flight hours, 1,600 of which are in the MA model. He was the SENSO for this mission. He is well liked and generally considered a mature, competent, and safe Naval Aircrewman who enjoys flying. There are no known interpersonal problems between his shipmates and him. He had been married for 3 years, separated for 4 years, and just recently formally divorced. He describes a good relationship with his ex-wife and an amicable divorce. He has no children and has been dating another woman

for the past 4 months. During the detachment he has communicated with his girlfriend and his family by e-mail and letters at least three times each week. He has never been involved in a mishap prior to this one although he was involved in an incident in which a tail chain was not removed prior to takeoff. This incident did not result in a mishap. He denies any psychosocial or financial problems.

NATOPS review was unremarkable.

Medical record review revealed the MAC to have a current flight physical on which he was found to be PQ/AA DIF NAC - SAR/HELO with no waivers. No active or recent medical problems were noted.

Review of his 72-hour history (SIR Form 3750/15) was unremarkable. His last flight was the night prior to the mishap with a land time of 0015 on the day of the mishap. He had 10.5 hours of uninterrupted sleep prior to the mishap. His last alcoholic beverage was approximately 6 days prior to the mishap. He was on no current medications.

Physiology training is up to date (SIR Form 3750/14 enclosure (4)).

The MAC sustained some superficial lacerations, and musculoskeletal injuries during the mishap (SIR Form 3750/14 enclosure (2)) likely from impact with the MA cabin contents when the MA impacted the water (he had released his harness prior to impact). He was released from ships medical within an hour of presenting. AFIP toxicology results were all negative or WNL as were locally run labs and a complete spine series (SIR Form 3750/14 enclosures (2) and (3)).

2. AEROMEDICAL DISCUSSION AND CONCLUSIONS (HFACS ANALYSIS)

a. Aeromedical Conditions Causal to the Mishap

(1) Unsafe Acts

(a) Violation (routine). MHAC failed to properly brief a cross-cockpit takeoff. Cross-cockpit takeoffs require a thorough briefing in order to ensure the aircrew has a common understanding of how the PAC's field of view will be effected.

This briefing is particularly important for less experienced aircrew. Nevertheless, the MHAC decided to allow the MH2P to make a cross-cockpit takeoff after the takeoff checklist had been completed, without an appropriate brief.

(b) Skill-based Error. The MH2P failed to apply sufficient left pedal during takeoff. The completion of flight control preflight checks normally results in a neutral pedal position. However, a neutral pedal position at takeoff, if not adjusted for increasing power when feet are resting on the pedals, will result in a right yaw of the aircraft.

(c) Skill-based Error. The MH2P failed to apply left pedal to arrest right yaw. Immediately following lift, the aircraft began a right yaw. The MH2P recognized that the yaw was unintentional and stated that he concentrated on holding the aircraft level. As the aircraft yawed through the relative wind (40 degrees to starboard), the MHAC also recognized that the yaw was unintentional and that the left pedal was slightly forward (approximately one half inch) of the right pedal. The MHAC applied full left pedal in one to one and one half seconds and estimates that left pedal input began at approximately 90 degrees of rotation and full left pedal was applied by approximately 135 degrees. The MHAC described the initial yaw rate as similar to a pedal turn, which accelerated as the rotation continued.

(d) Decision Error. MH2P failed to lower the collective once the right yaw was recognized and when directed. In the NATOPS flight brief, the MHAC directed that in the event of uncommanded yaw over the flight deck the appropriate response was to "put the aircraft down." At the onset of right yaw, the MH2P stated that he concentrated on maintaining a level attitude and was "trying to hold it steady." The MHAC first made yaw control inputs, then verbally directed the MH2P to "put it down." The MH2P remembers hearing the MHAC say, "put it down" but he continued to attempt "to hold [the aircraft] steady." When the MH2P failed to respond to verbal commands the MHAC

lowered the collective, without taking controls, and observed that the MH2P's left arm was straight.

(e) Skill-based Error. The MH2P failed to completely lower the collective while the MA was over the flight deck. The MHAC verbally directed the MH2P to lower the collective and then made a physical input to reduce power. After approximately 210-230 degrees of yaw, the MA impacted the flight deck, bounced alternately on the main mounts, skidded, and yawed before coming to rest on the starboard edge of the flight deck heading approximately 315 degrees relative. The MH2P recalls that as the aircraft teetered on the flight deck edge, that he lowered the collective fully down; too late to counter the rotational momentum and prevent the mishap.

(f) Skill-based Error. The MHAC failed to ensure that the collective was fully lowered. With full left-pedal input made, the MHAC gave a verbal command to the MH2P to put it down. The MHAC came on the collective and lowered it, observing that the MH2P's left arm was extended and straight. The MHAC's observation of the MH2P's arm led him to believe that the collective had been fully lowered. However, the MH2P did not completely lower the collective until the MA was on the flight deck edge. Fully lowering the collective would likely have resulted in the MA landing sooner, with a slower yaw rate, and permitted the MA weight to counter rotational momentum.

(2) Preconditions for Unsafe Acts

(a) Adverse Mental State. The failure of the MH2P to make sufficient pedal input resulted from a fixation on avoiding abrupt collective movement. This was done in an attempt to compensate for his tendency to be abrupt on the flight controls.

(b) Adverse Mental State. MH2P’s fixation may have been compounded by peer pressure and preoccupation with performing his first cross-cockpit takeoff.

(c) Adverse Mental State. The fatigued state of the MHAC contributed to the poor communication and coordination during takeoff. The MHAC was mildly sleep deprived (he had received an average of 6.5 hours of sleep during the previous 72 hours

(d) Crew Resource Management. The MH2P failed to communicate with the MC. Communication is an integral part of aircrew coordination. The ability to verbalize a situation helps to focus efforts on appropriate actions. As the aircraft yawed right, the MH2P focused on holding the MA steady and did not communicate his lack of control or his intentions to the MC. Had the MH2P immediately communicated his perceptions of the situation, the MHAC may have been able to respond prior to build up of the yaw rate.

(3) Unsafe Supervision

(a) Failed to Correct a Known Problem. The Detachment HAC (not MHAC) failed to provide the OIC with adequate information regarding the professional development of the MH2P. The MH2P was at the controls during two previous incidents of unintentional right yaw. In both cases, the maneuvers were induced by improper flight control inputs and involved right yaw of approximately 180 and 290 degrees respectively. The HAC (same in both incidents) failed to promptly inform the OIC of these incidents of unintentional right yaw and downplayed their seriousness when he did debrief the OIC. Uncontrolled aircraft motion in any environment is a serious safety of flight issue, even more so at night or over a single spot deck. The HAC's failure to quickly and accurately relay these incidents, and his willingness to downplay their serious nature inhibited the OIC's ability to recognize a skill deficiency pattern in the MH2P's flying abilities. Based on the above analysis the AMB concludes that the detachment HAC failed to provide the OIC with adequate information regarding the professional development of the MH2P.

(b) Inadequate Supervision. The OIC (MHAC) failed to provide adequate professional guidance. As the ship's aviation safety officer, the detachment OIC is responsible for establishing and supervising the safe conduct of embarked flight operations. This responsibility includes oversight of aircrew proficiency and professional development. Given that the mishap was the third incident of unintentional right yaw for the MH2P while on this deployment it stands to reason that the OIC (MHAC) would have taken measures to prevent its occurrence in the future. Although the detachment HACs periodically met to discuss the professional development of the H2Ps, the importance of reviewing operations in light of safety requirements was not sufficiently ingrained to properly highlight a hazardous pattern with the MH2P. Thus, detachment flight safety awareness was insufficient to recognize a significant flight hazard and this inability resulted from supervisory failure to establish and maintain strong safety communication links.

b. Maintenance Conditions Causal to the Mishap

(1) Unsafe Maintainer Acts

(a) Violations. Examination of the tail rotor servo revealed internal scuffing on the piston. An EI stated that the scuffing occurred over a period of time, prior to the mishap. The tail rotor servo was changed during a phase inspection six weeks prior to the mishap. The mechanic who replaced the servo stated that he did not refer to the maintenance publication during the process, as required by the directive. The mechanic felt he knew by memory the proper steps for removing and replacing the servo.

(b) Error. The mechanic failed to properly align the piston during tail rotor servo installation IAW the maintenance publication. The mechanic stated that he thought there was only one correct way to install the servo. A review of his process indicated that he failed to properly align the servo rod to its connector. Misalignment of the servo piston could result in internal chaffing of the piston with its outer

casing. The mechanic misjudged the importance of proper servo alignment.

(2) Unsafe Management Conditions

(a) Supervisory. Removing and replacing a tail rotor servo requires the completed installation be inspected by a CDI. The CDI observed the completed work. However, due to his trust in the mechanic's previous workmanship, the CDI did not closely inspect the completed action. Inadequate supervision of the mechanic's work by the CDI resulted in the CDI missing the incorrect servo rod installation.

c. Aeromedical Conditions Causal of Additional Damage or Injury

(1) Unsafe Acts

(a) Skill-based Error. The MH2P failed to properly use his HEED bottle resulting in the aspiration of sea water. Initially hesitant to use his HEED bottle, he attempted to locate the emergency window release handle to egress. However, he was unable to locate the handle. Feeling the need for air, he then attempted to use the HEED but forgot to purge the bottle completely prior to his first breath resulting in the aspiration of water. He successfully egressed after approximately 1 minute underwater.

(b) Decision Error. The MAC received first aid injuries after releasing his harness prior to impact. When the MA settled onto the flight deck edge, numerous equipment bags in the tunnel fell aft onto the MAC. He released his harness and proceeded to throw the bags out the cabin door. When the MA pitched and rolled over the edge, the MAC seized some hand holds but was thrown forward when the MA hit the water. Relatively low impact forces kept the MAC from sustaining serious injury as he was thrown about the cabin.

(2) Preconditions for Unsafe Acts

(a) Adverse Mental State. The MH2P stated that after water impact he was a little confused and swallowed a lot of water. This likely contributed to his failure to initially use, and subsequently purge, his HEED bottle.

(c) Organizational Influences

(a) Resource Management. The design of the HEED bottle made it likely that aspiration of water will occur if not purged properly during egress. Given that water mishaps are often met with subsequent states of panic when submerged, several aircrew have either aspirated water while using the HEED improperly or have elected not to use the HEED device for fear of aspirating water. Had the HEED device been designed with a dual regulator, the need to purge the device prior to use would be alleviated.

d. Aeromedical Conditions Present But Not Contributory to Either the Mishap or Additional Damage or Injury

(1) Unsafe Acts

(a) Decision Error. MH2P removed his helmet prior to egress. This action, although improper, did not result in additional injury. It does, however, offer insight into the mental state of the MH2P while he was submerged.

(b) Decision Error. MAC removed his helmet prior to egress. The shaded visor of the helmet came loose impeding his vision. He removed his helmet to see better. This action, although improper, did not result in additional injury. A HAZREP regarding potential problems with helmet visors was submitted.

(c) Decision Error. MAC re-entered the sinking MA. Contrary to the Naval Aviation Water Survival Training Program teaching, the MAC re-entered the sinking MA (with only his upper torso) in search of a missing crewman. This action placed the

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MISHAP SEQUENCE OF EVENTS

	Causal Factor	HFACS Category
1.	MHAC failed to properly brief a cross-cockpit takeoff.	Violation
2.	The MH2P failed to apply sufficient left pedal during takeoff.	Skill-based Error
3.	The MH2P failed to apply left pedal to arrest right yaw.	Skill-based Error
4.	MH2P continued to hold the AC steady and failed to lower the collective once the right yaw was recognized, and when directed.	Decision Error
5.	The MH2P failed to completely lower the collective while the MA was over the flight deck	Skill-based Error
6.	The MHAC failed to ensure that the collective was fully lowered.	Skill-based Error
7.	The failure of the MH2P to make sufficient pedal input resulted from a fixation on avoiding abrupt collective movement.	Adverse Mental State
8.	MH2P's fixation may have been compounded by peer pressure and preoccupation with performing his first cross-cockpit takeoff.	Adverse Mental State
9.	The fatigued state of the MHAC contributed to the poor communication and coordination during takeoff.	Adverse Mental State
10.	The MH2P failed to communicate with the MC.	Crew Resource Management
11.	The Detachment HAC (not MHAC) failed to provide the OIC with adequate information regarding the professional development of the MH2P.	Failed to Correct a Known Problem
12.	The Detachment OIC (not MHAC) failed to provide adequate professional guidance.	Inadequate Supervision
13.	Maintainer failed to use proper maintenance publication	Violation
14.	Maintainer failed to properly align tail rotor servo piston	Error
15.	CDI failed to properly supervise subordinate personnel	Supervisory

MAC at a significantly increased risk of further injury or death. It did not, however, result in additional injury.

3. Aeromedical Recommendations

a. For HSL 99: Recommend aviation performance review to determine MH2P's suitability for continued flight status.

Reporting Custodian	HELSQUAD009	Mishap Severity:	A
Date of Mishap:	01 Dec 98	Mishap Category:	FM
Aircraft Model:	H-3	BUNO:	645123

b. For HSL 99: Conduct pilot training on the hazards associated with the pilot not at the controls making single axis control inputs and the increased communications required to safely cross control an aircraft.

c. For HSL 99: Recommend aircrew training that reviews the importance of conducting thorough pre- and post-flight briefs.

d. For HSL 99: Recommend training for all aircrew to include comprehensive review of aircrew coordination and human factors processes. Training should include review of operational risk management principles and individual obligations to identify and report hazards.

e. For HSL 99: Recommend aircraft commander training on the importance of documenting and reporting the professional development of junior pilots.

f. For HSL 99: Recommend review of current NATOPS procedures covering loss of tail rotor drive to determine if a submission of NATOPS change for loss of tail rotor drive below the recommended cutgun height of 30 feet is appropriate.

g. For COMHSLWINGX: Recommend review of the current OIC course curriculum to determine if the current training adequately addresses the unique safety and human factors requirements associated with deployed-detachment operations.

h. For COMNAVAIRSYSCOM: Accelerate procurement of HEED bottle with dual regulator for use by all helicopter communities.

i. For COMNAVAIRSYSCOM: Develop a lightweight, flexible and easy-to-use cargo net system for use in the H-60 tunnel.